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## Fish Farming FAQs

Marine aquaculture, in particular finfish farming, is a relatively new industry for the United States. Stimulated by the recognition that capture fisheries could not meet the growing demand for seafood, salmon farms were established in U.S. coastal waters, primarily in the Gulf of Maine and the Pacific Northwest. During the industry's incubation period, justifiable concerns over the impact of these farms on the surrounding ecosystems arose. Since then, advances in engineering, fish husbandry, and site location have significantly reduced its environmental impact. What is the outlook for the future? Compiled by the Open Ocean Aquaculture Project at the University of New Hampshire, this sheet looks at common assumptions about marine aquaculture today, and its prospects for moving to the open ocean.

### What is marine aquaculture?

Also referred to as "mariculture," marine aquaculture is the farming of food products in ocean waters. Popular commercial crops in the United States include clams, mussels, seaweeds, shrimp, and salmon. Much of this activity takes place in nearshore coastal waters. With such waters already crowded with other activities, research initiatives like UNH's Open Ocean Aquaculture Project (OOA) in the Gulf of Maine are exploring the environmental and economic prospects of farming finfish and shellfish in the open ocean.

### Does finfish farming impact the ocean bottom?

Early fish farms were sited in protected bays and coves for operational convenience and to protect cages from weather and currents. In shallow water sites with less circulation, excess fish feed and waste sometimes built up on the ocean floor, creating an oxygen-poor environment in which many bottom-dwelling species could not survive.

To reduce waste buildup, most farmers have adopted management practices that involve strategic site selection criteria, improved feed formulation, optimum stocking densities, feed loss monitoring, a better understanding of currents and tides, and cage site rotation.

In the open ocean, deep water and increased circulation reduce the likelihood of impact on the sea floor. A rigorous monitoring program has determined that UNH's OOA has had no measurable environmental impact in the Gulf of Maine.

### Does shellfish culture impact the environment?

Shellfish feed by filtering plant cells from the surrounding water. As a result, shellfish farms actually improve water quality. Currently, OOA researchers are exploring the environmental benefits of integrating the farming of blue mussels and finfish such as cod. In such a system, mussels remove the excess carbon and nitrogen that comes from feeding fish.

### Does marine aquaculture involve genetically modified fish?

Fish farmers have never raised genetically modified fish in U.S. coastal waters. The preferred method for broodstock development is selective breeding. Currently, all open ocean aquaculture projects in the U.S. involve species native to the region in which the project takes place. UNH's OOA raises blue mussels, cod, haddock, and halibut.

### Do escaped fish threaten wild stocks?

Fish can escape from net pens damaged by storms, predators, or even the farmed fish themselves. Scientific perspectives on the impact of escaped fish on wild stocks vary. For this reason, and for cost-effectiveness, the industry has developed more durable equipment. Today's cages and anchoring systems are far more robust, and have dramatically reduced the number of escaped fish. In five years of farming in the harshest ocean conditions, UNH's OOA has not had one fish escape.

### How many pounds of wild fish does it take to raise a pound of farmed fish?

In the wild, carnivorous fish such as salmon will consume roughly 10 pounds of fish to gain one pound of body weight. Farmed fish also consume wild fish—albeit as an ingredient in formulated feed. This feed is made from fish meal and oil, and vegetable-based fats, proteins, and carbohydrates. As a result, farmed fish consume only about three pounds of processed, wild fish for every pound they gain.

Most of the fish meal in feed comes from the anchovy fishery off the coast of South America. The annual capture of this fishery has remained stable since the 1960s, despite the rise in aquaculture. Approximately 30 percent of the world's fish meal production is used to feed fish; the remainder goes to pig and chicken feed.

The OOA's study of fish physiology and behavior with biotelemetry and video techniques is laying the foundation for more efficient feeding practices.

### Are there health risks associated with eating farm-raised salmon?

Despite recent reports about the levels of PCBs in farmed salmon, it remains a heart healthy diet choice, according to the American Heart Association. The association holds that this advantage far outweighs the modest risks suggested by these reports. Levels of PCBs and other persistent environmental chemicals found in farmed salmon are significantly lower than FDA standards, and lower than levels found in many other popular foods such as dairy products, meat, and poultry.

### Are antibiotics used in farmed fish?

Marine aquaculture has made tremendous progress in the use of probiotics and vaccinations before fish are stocked into cages. Over 10 years, antibiotic use has declined 97 percent, while production has increased 360 percent.

### What is the outlook for the future?

Healthy oceans are vital to our physical and economic well-being. For aquaculture to succeed, it must be developed within the context of surrounding ecosystems. Projects that advance the industry's profitability must be consistent with efforts to restore and sustain the health, productivity, and biological diversity of the oceans.

Phase II of UNH's Open Ocean Aquaculture Project is being designed with this in mind. Its holistic approach will account for the safety of the people who manage the farms, the well-being of the crops, the integrity and efficiency of the structures and systems, the health of the surrounding environment, the consumers who rely on seafood products, and the dynamic relationships that weave all of these together.

We welcome your interest and questions:

<http://ooa.unh.edu>

